Listing of Claims:

1. (Currently Amended) A method for manufacturing a diamond film comprising:

~~using a pulsed microwave plasma, in which, in a vacuum chamber,~~ forming a plasma of finite volume ~~is formed~~ near a substrate by subjecting a gas containing at least hydrogen and carbon in a vacuum chamber to periodic pulsed discharges using a pulsed microwave plasma by applying~~, forming~~ a repeated succession of a low-power state and a high-power state, and having a peak absorbed power P_C, so as to obtain at least carbon-containing radicals in the plasma, and

~~to~~ depositing the said carbon-containing radicals on the substrate in order to form a diamond film thereon; ~~and~~

wherein the power being injected into the volume of the plasma with a peak power density of at least 100 W/cm^3 while maintaining the substrate to a substrate temperature of between 700 °C and 1000 °C.

2. (Previously Presented) The method according to Claim 1, in which a plasma having at least one of the following features is generated near the substrate:

– the pulsed discharge has a certain peak absorbed power P_C and the ratio of the peak power to the volume of the plasma is between 100 W/cm^3 and 250 W/cm^3,

– the maximum temperature of the plasma is between 3500 K and 5000 K,

– the temperature of the plasma in a boundary region of the plasma located less than 1 cm from the surface of the substrate is between 1500 K and 3000 K and

– the plasma contains hydrogen atoms having a maximum concentration in the plasma of between 1.7×10^{16} and 5×10^{17} cm^{-3}.

3. (Previously Presented) The method according to Claim 1 or Claim 2, in which said gas contains carbon and hydrogen in a carbon/hydrogen molar ratio of between 1% and 12%.

4. (Previously Presented) The method according to Claim 1, in which said gas contains at least one hydro-carbon, and a plasma having a concentration of the carbon-containing radicals of between 2×10^{14} cm^{-3} and 1×10^{15} cm^{-3} is generated.

5. (Previously Presented) The method according to Claim 1, in which a pulsed discharge is produced, in which the ratio of the duration of the high-power state to the duration of the low-power state is between 1/9 and 1.

6. (Previously Presented) The method according to Claim 1, in which at least one of the following parameters is estimated:

– a substrate temperature,

– a temperature of the plasma,

– a temperature of the plasma in said boundary region, located less than 1 cm from the surface of the substrate,

– a concentration of atomic hydrogen in the plasma,

– a concentration of carbon-containing radicals in the plasma,

– a concentration of carbon-containing radicals in said boundary region close to the plasma,

– a pressure of the plasma and

– a power density of the plasma,

and the power emitted as a function of time is adapted according to at least one of these parameters.

7. (Previously Presented) The method according to Claim 1, in which the plasma is contained in a cavity with at least one of the following properties:

– the pulsed discharge has a peak power of at least 5 kW at 2.45 GHz,

– the pressure of the plasma is between 100 mbar and 350 mbar and

– the gas containing hydrogen and carbon is emitted with a ration of the flow rate to the volume of plasma of between 0.75 and 7.5 sccm/cm^3.

8. (Previously Presented) The method according to Claim 1, in which the plasma is contained in a cavity with at least one of the following properties:

– the pulsed discharge has a peak power of at least 10 kW at 915 MHz,

– the pressure of the plasma is between 100 mbar and 350 mbar and

– the gas containing hydrogen and carbon is emitted with a ratio of the flow rate to the volume of the plasma of between 0.75 and 7.5 sccm/cm^3.